

## **Attachment 5: Work Plan**

The scope of the proposed project would supply additional monitoring wells, monitoring equipment, and funding necessary to complete the aquifer tests necessary to determine the feasibility for new shallow extraction wells to be located at the Harkins Slough Project Recharge Facility.

- ❑ **Task 1.0 – Assess Current Monitoring Well and Production Well Network**
  - Consultant Hydrogeologist – Review existing data sets related to the project (water level, water chemistry, climate, and project operations). Identify location, frequency, and length of all data sets. Review construction information for all wells existing within the network. Data analysis will be required to site and design specifications for monitoring wells to be included in request for proposal which will be completed as a component of task 2. Develop Basis of Design Technical Memorandum for new Monitoring Wells.
  - Staff hydrologist – Work with Consultant Hydrogeologist to assess the current well network & develop the Basis of Design Technical Memorandum for new Monitoring Wells
- ❑ **Task 2.0 - Design, Permit, Construct & Develop six shallow monitoring wells**
  - 2.1 - Permitting Santa Cruz County
    - Staff hydrologist – Agency will be responsible for obtaining Environmental Health Permits through Santa Cruz County and filing the CEQA exemption notice. Permits are required for drilling.
  - 2.2 - Prepare Bid Package
    - Consultant Hydrogeologist – Bid package will be prepared and placed up for bid by the Agency. Request will outline timeline, location, construction specifications, drilling method, mobilization/demobilization, cutting disposal, well development, and well head construction requirements for the contractor. Final well design will be completed following lithological logging of each borehole. Screens will be set directly above a clay layer found at roughly 40-45 feet elevation.
  - 2.3 - Drill three monitoring wells – Monitoring wells will be drilled, logged, constructed, and developed per specifications.
    - Mobilization/Demobilization – Driller mobilization must occur within the time frame set in the contract. This item will include, but is not limited to installing and necessary signs, fencing, security measures, traffic control, and controlling water runoff from the site. This shall be paid as a lump sum in the contract. No standby time may be accrued prior to completion of mobilization.
    - Drill Borehole – This task will require drilling six (6) 10-inch diameter boreholes to approximately 100 linear feet each. Drilling method will be hollow stem auger. Drilling may not take place without the presence of a professional geologist on site. The professional geologist may be from the Agency's staff, or a consulting hydrogeologist. Samples will be collected every 5 to 10 feet from the cuttings and logged according to the USCS soil classification system by the onsite professional geologist. Payment for this task will reflect the actual linear feet drilled for all six boreholes.
    - Install Well Casings in Each Bore – Casing shall consist of 5-inch diameter, SDR 21 PVC, with the following tentative completion schedule: 0 to 60 ft. – blank; 60 to 100 ft. –

screen; 100 to 110 ft. – blank cellar (Figure 9). The well screen shall have 0.040-inch horizontal machine cut slots. Casing shall be flush threaded, and centered within the borehole using centralizers.

- Install 5-inch diameter SDR 21 PVC Blank Casing (Cellar) – The bid price for this item shall include furnishing and installing approximately 60 linear feet of blank casing. The PVC shall be screw together self sealing and PVC cement shall not be used in construction of well. PVC spacers or stabilizers will be used so the Agency can repeat induction logs of the well to determine changes in water quality opposite the casing. The cellars will serve as sediment traps so the screens do not become clogged with sediment over the life of the well.
- Install 5-inch diameter SDR 21 PVC Screen – The price for this item shall include furnishing and installing approximately 240 linear feet of 0.040 factory slotted screens. PVC spacers or stabilizers will be used at the top and bottom of the screen to allow future induction logging of the wells.
- Install 5-inch diameter SDR 21 PVC Blank Casing – The bid price for this item shall include furnishing and installing approximately 750 linear feet of blank casing. The PVC shall be screw together self sealing and PVC cement shall not be used in construction of well. PVC spacers or stabilizers will be used so the Agency can repeat induction logs of the well to determine changes in water quality opposite the casing.
- Install Gravel Pack – The price for this item shall include furnishing and installing approximately 500 linear feet of 8X16 filter pack in the six 10-inch boreholes.
- Install Bentonite Seals – The price for this item shall include furnishing and installing approximately 30 linear feet of bentonite seal above the well screens in the six 10-inch boreholes.
- Install Cement-Bentonite Grout – The price for this item shall include furnishing and installing approximately 300 linear feet of cement-bentonite grout in the six 10-inch boreholes.
- Well Development –
  - Following completion of the wells and allowing at least 24 hours for all grout to cure, the wells will be airlifted until water is clear. Turbidity of development water will be logged throughout the process.
  - Purchase 4-inch diameter test pump (~50 gpm).
  - Deploy 4-inch diameter test pump and develop wells using the pump and surge method.
- Site Cleanup – Site will be restored to pre-construction conditions.
- Submittals - Driller will file driller's report to the California Department of Water Resources
- Consultant Hydrogeologist – Well construction design and oversight.
- Staff Hydrogeologist - Well construction design and oversight.
- 2.4 – Prepare Well Construction Technical Memorandum.
  - Consultant Hydrogeologist and Staff hydrologist will collaborate to prepare a Technical Memorandum of well installation and development activities.

❑ **Task 3.0 - Install Continuous Monitoring Equipment and Water Sampling**

**Equipment in Wells** – Deploying instruments in the wells will allow the Agency to capture the signal of pressure responses to percolating water in the recharge pond, as well as interference from adjacent wells during Aquifer Testing. The data loggers will log water level (pressure). The existing monitoring well network already contains such instruments and will also be monitored during the aquifer tests. These data will be essential in determining aquifer properties such as hydraulic conductivity and transmissivity.

- Purchase data loggers – Purchase six Rugged Troll data loggers to log pressure in the shallow monitoring wells.
- Program and install data loggers - synchronize all data logger clocks and program them to sample the same units and frequency. Design and construct wellhead retention to hold data loggers in the screens of the wells. Deploy loggers in wells.

❑ **Task 4.0 – Aquifer Testing** – The primary goal of this study is to learn more about the properties of the shallow aquifer underlying the recharge basin. The test pump purchased by the Agency during Task 2 will be used to perform pumping tests on the new monitoring wells. Instruments deployed in adjacent monitoring wells will be used to measure the response of the aquifer to test pumping such that aquifer properties like hydraulic conductivity and transmissivity can be determined.

○ 4.1 – Conduct Aquifer Tests

- Under the supervision of a licensed professional geologist, conduct pumping tests of the new shallow monitoring wells using the test pump purchased during Task 2. Each pair of wells will be pumped for a minimum of 8-hours. Flow will be measured using a flow meter and changes in water level will be measured by the autonomous pressure transducers.

○ 4.2 – Collect Monitoring Data

- During operation of recharge facility, and during the aquifer tests, data will be collected using high resolution time steps, such as 5-minute intervals.
- Download water level loggers – Rugged Trolls and all other water level logging equipment will be downloaded on a daily to weekly frequency. Spot water level measurements will be taken weekly to check for drift in the data loggers and serve as quality control. Data will be checked imported into an existing water level database and corrected for fluctuations in barometric pressure.
- Sample Wells – Water samples will be during aquifer testing from the new shallow wells. Water samples will also be collected from the existing well network through the use of dedicated low-flow pumps which are already in place..
- Groundwater Sample analysis – Water analysis will be completed for general minerals at an EPA/ELAP certified lab. Chain of custody protocol and sample hold times will be observed for all samples.

○ 4.3 – Data Analysis

- Consultant Hydrogeologist and Staff hydrologist will analyze data collected during the aquifer tests and determine aquifer properties at the three localities where the tests were performed.

- 4.4 – Prepare Aquifer Test Technical Memorandum
  - Consultant Hydrogeologist and Staff hydrologist will collaborate to prepare a Technical Memorandum detailing the methods, results and conclusions of the aquifer tests.
- **Task 5.0 –Final Report Preparation** – Consulting hydrogeologist and Staff hydrologist will collaborate to prepare a report summarizing the grant funded study. The report will synthesize the main points from the three Technical Memoranda described above in addition to summarize the projected versus actual budget and schedule. The final report will be submitted to the DWR.

**Figure 9.**

**Generalized**  
**Well Diagram**

ft. bgs      ft. Alt.

